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ABSTRACT

Any program for the state, local, or federal levels designed to produce more math and science teachers should recognize the special needs of the small, rural, and isolated school. Rural teachers can expect generalized teaching assignments with a greater diversity of subject matter responsibilities than teachers in larger, urban settings. There is a tendency to retain the small, rural schools. We must develop programs and teachers that are qualified to teach in the rural settings. Whatever changes are made to accommodate the science program to local needs in the rural community, they must be consistent with good science and good education. Outside resources will have to be available to support rural teachers who wish to improve their teaching of mathematics and science. The science and mathematics education needs of 30% of our students living in rural America should not be neglected. If they are not to continue to be the poeple left behind, the funding programs and training programs must recognize the differences of the teachers going to the rural areas. (Author/BRR)

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WRITTEN TESTIMONY FOR UNITED STATES SENATE BUDGET COMMITTEE

Hearing Held in Las Cruces, New Mexico
February 11, 1983

Science and Mathematics Teachers' Needs in the Rural Schools

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WRITTEN TESTIMONY FOR SENATE BUDGET COMMITTEE
Hearings Held in Las Cruces, New Mexico, February 11, 1983

Science and Mathematics Teachers' Needs in the Rural Schools

It is widely accepted today that one of the critical needs of education in the United States is that of supplying more mathematics and science teachers for our schools. While the situation is critical throughout the schools of our nation, it is extremely dangerous in our small and rural schools. There are two main reasons for this serious situation in the rural schools in America. The first is that a great many teachers in the past have been reluctant to go to rural schools. The second reason is that a different type of a math or science teacher is needed for the rural schools than in the urban schools. This will be discussed in more detail later in this paper.

Weiss (1978) in the "1977 National Survey of Science, Mathematics and Social Studies Education Highlights Report" indicated that only 22% of the science teachers in the nation felt very well qualified while 60% that they were not well qualified at all. In the area of mathematics, 49% felt they were well qualified, while 46% felt they were not well qualified at all. This situation is true with teachers across the nation. If a survey were taken of just rural teachers, it is my opinion that these numbers of feeling not well qualified would be much, much higher than they are for the total teacher population. There is also some conflict regarding general teacher supply and demand for the future. As reported by Rober Roth in the November-December, 1981 issue of Journal of Teacher Education, much of this confusion results from failure to distinguish among supply and demand data, reports by geographic school settings (urban, suburban, rural), subject area, method of collecting data, and technique used for projection. He went

on to say that the states currently experiencing the greatest teacher shortage are Alaska, Colorado, Georgia, Indiana, Missouri, North Dakota, South Dakota, Texas, and Wyoming. In each of these states, there are large numbers of rural people. Some of them, such as Alaska, Colorado, North Dakota, South Dakota, and Wyoming are primarily rural states. He again reported that subject areas where shortages exist more often than in other areas were mathematics, science, agriculture, special education, industrial arts, and vocational, techincal subjects.

In a personal telephone conversation on January 7, 1983, Mr. Dakay, the science consultant from the Office of Public Instruction in Idaho, noted that particularly in the small schools many teachers are teaching mathematics or science for which they are not certified. They are allowed to teach for a set time at the end of which they must have taken the needed coursework. He said that in many cases Idaho's teachers are moved from the junior high school to teach high school science or mathematics courses. Although these teachers are not qualified in all areas of science, most have a fair background and it does not require a great deal of coursework through the colleges to receive certification. To fill the vacant slots left in the junior high school, an elementary teacher who has an interest in science has been used. Mr. Dakay was very concerned about what the results of such a practice were on the students.

Some states feel that most of the teachers teaching science and mathematics in the rural schools may have met the certification requirements, but some are concerned about whether they are qualified. In another telephone conversation with Mr. Dan Dolan of the Montana Office of Public

Instruction, he said there were very few teachers who are not certified in their areas of teaching. He did, however, have reservations about the qualifications of the teacher versus certification. He said there may exist many cases in the small schools where a person with a minor in mathematics or science is teaching in the area beyond the scope of their second subject area training.

J. Guay (1980) in a study done in Southern Alberta entitled "Biology and Life Science Classroom Teaching Environment in Southern Alberta" reported that 20% of all the teachers who responded to the survey reported having no biology courses in their post secondary academic backgrounds. Nearly 30% reported having no zoology courses. Botany and chemistry courses were absent from the backgrounds of 44% of the biology and life science teachers in the survey of rural teachers. In a comparison of the urban versus rural, he also found that the urban teachers were better prepared than the rural teachers.

In a report by Beck and Smith (1982) when they surveyed the needs of 587 school superintendents in Texas in schools having fewer than 1000 students, they found that in the top ten of the greatest single needs in the district the greatest was having qualified mathematics teachers.

Generalists versus Specialists

There is a trend among colleges training teachers for the individual to become much more specialized. This continues in the training of mathematics and science teachers for the rural schools. The dangers which exist today will become even more volatile in the future. We know

that the rural teacher is the generalist rather than a specialist, and due to the small schools and isolation this will continue in the future.

Colton (1981) in a paper entitled "The Science Program in Small Rural Secondary Schools" reported that the lack of specialists in each of the separate scientific disciplines, such as biology, chemistry, science, or physics, could be a grave disadvantage if these separate disciplines are required to have specialists and only one or two are available. He goes on to advocate that science courses based on specific themes, such as energy crisis be taught and then one or two teachers with sufficiently broad training can cope especially if they are free to design courses based on familiar, local situations and resources.

Guay (1980) in the Canadian study, stated that teachers of biology and life science courses in urban locations reported more specialized instructional assignments than their rural counterparts, especially at the senior high level. At this level all urban respondents reported teaching only biology and life science. Only one of six rural senior high teachers, one of the 13 teachers in combined junior-senior rural locations could make this claim. The senior high teachers in rural areas taught up to four of their subjects in addition to biology and life science. The teachers in rural combined junior-senior high schools averaged three other subjects.

Colton (1981) indicated that the job of teaching science in small, rural high schools can be very different from that in the large urban

school where specialists in several scientific disciplines are involved. What is needed in the rural school is not the specialized physicist, chemist, biologist, or earth scientist, but a teacher who has a sound grasp of the basics of all these to understand their relationships and interpret the rural environment to guide the investigation at the level necessary to satisfy the needs of high school students. For this purpose a good ground in biology and basic physical science is necessary with some understanding of the earth sciences and perhaps basic chemistry. Teacher education institutions must be aware of the needs of combining teaching endorsements for the rural science and math teacher.

In the Texas study done by Beck and Smith (1982) of the 21 combinations of subjects needed by teachers, 7 of these were combinations of either math or science. Also, of the top six they found four combinations needed in math and science with other subjects. Guay (1980) indicated that the subjects most likely to be combined for biology teachers in rural senior high schools were chemistry and mathematics. In the rural junior high locations almost every subject in the curriculum was included in at least one teacher's assignment.

Recommendations and Conclusions

Any program for the state, local, or federal levels designed to produce more math and science teachers should recognize the special needs of the small, rural, and isolated school. Rural teachers can expect generalized teaching assignments with a greater diversity of subject matter responsibilities than teachers in larger, urban settings. There

is a tendency to retain the small, rural schools. These problems will remain with us for a long time. It is also recognized that by making these small schools bigger, it does not necessarily make them better. We must develop programs and teachers that are qualified to teach in the rural settings. Whatever changes made to accommodate the science program to local needs in the rural community, they must be consistent with good science and good education. Science teaching must play its part in developing those skills and attributes which we expect to find in an education person. Wherever a base or pathway to learning may be, it must lead the student to an understanding of the basic concepts of science. Colton (1981) also goes on to state that in the future more teachers specifically trained for the rural schools should be available. Outside resources will also have to be available to support rural teachers who wish to improve their teaching of mathematics and science.

The science and mathematics education needs of 30% of our students living in rural America should not be neglected. If they are not to continue to be the people left behind, the funding programs and training programs must recognize the differences of the teachers going to the rural areas. There is a strong need for generalists rather than specialists, and a person should be flexible enough to teach a number of different areas.

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